TD 9-6920-892-10
TM 6920/08953A-10/11

TECHNICAL MANUAL

OPERATOR'S MANUAL

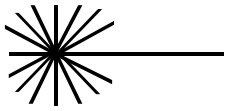
MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES 2000)

TACTICAL ENGAGEMENT SIMULATION SYSTEM (TESS) FOR MAIN GUN SIGNATURE SIMULATOR (MGSS) (KEYLESS)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS
You can help improve this manual. If you find any mistakes or you know of a way to improve the procedures, please let us know. Mail your letter, DA FORM 2028 (Recommended Changes to Publications and Blank Forms), or DA FORM 2028-2 located in back of this manual directly to Commander, Simulation, Training, and Instrumentation Command (STRICOM) ATTN: AMSTI-OPS-L; 12350 Research Parkway, Orlando, FL 32826-3276. Marine Corps users submit NAVMC 10772 to: Commander, Marine Corps Logistics Base (Code 826), 814 Radford Boulevard, Albany, GA 31704-1128.

HEADQUARTERS, DEPARTMENT OF THE ARMY AND UNITED STATES MARINE CORPS

27 MAY 2002



LASER WARNING

Suitable precautions must be taken to avoid possible damage to the eye from overexposure to radiated laser energy. Precautionary measures include the following:

- **NEVER fire the laser** at personnel within 10 meters.
- **NEVER look at the laser transmitter** through magnifying optics such as binoculars, telescopes, or periscopes at ranges less than 40 meters.

PYRO WARNING

- Use safe/proper handling procedures when removing undetonated pyrotechnic cartridges. Dispose of undetonated cartridges in accordance with local SOP.

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES

NOTE: The portion of the text affected by changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original . . . . . 0 . . . . . 7 December 1999
Change.....1.....17 December 2001

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 49 CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.
Title	0		
A	0		
i - iii	0		
iv Blank	0		
a - c	0		
d Blank	0		
1-1 - 1-11	0		
1-12 Blank	0		
2-1 - 2-20	0		
3-1 - 3-9	0		

***Zero in this column indicates an original page**

TABLE OF CONTENTS

TABLE OF CONTENTS-Continued

PAGE

LIST OF FIGURES

PAGE

LIST OF TABLES

PAGE

Intentionally left blank.

SAFETY SUMMARY

WARNING

- Personnel can be killed or injured by turret movement. Never install or remove MILES 2000 equipment in/on an M1A1/A2 Abrams and M2/M3 Bradley unless **TURRET TRAVERSE LOCK** is **LOCKED** and the **VEHICLE MASTER POWER** switch is **OFF**.

- Tankers must wear earplugs. Your hearing can be damaged by the Main Gun Signature Simulator (MGSS) and Direct/Indirect Fire Cue (DIFCUE) firing. All personnel within 26 meters of an armed MGSS or within four (4) meters of an armed DIFCUE area must wear single hearing protection. Keep ALL vehicle hatches closed when firing the Anti-Tank Weapons Effect Signature Simulator (ATWESS), MGSS or DIFCUE.

- A protective mask must be worn during exposure to DIFCUE colored smoke.

- Your hearing can be damaged by an ATWESS cartridge. All personnel within 90 meters of an armed ATWESS must wear hearing protection.

- To preclude fragmentation hazards, personnel shall not be closer than five (5) meters from an armed MGSS, two (2) meters from an armed DIFCUE, and 60 meters from an armed ATWESS

- MILES equipment transit cases have a multiple personnel lifting requirement. Failure to use sufficient personnel could result in injury during installation or removal.

- Use safe/proper handling procedures when removing undetonated pyrotechnic cartridges. Dispose of undetonated cartridges in accordance with local SOP.

FIRE/EXPLOSION WARNING

- Personnel can be killed, burned, or otherwise injured if a pyrotechnic charge in an ATWESS, MGSS or DIFCUE accidentally ignites or explodes.

- **NO SMOKING, heat, or open flame,** within 50 feet of an ATWESS, MGSS or DIFCUE.

- A strong shock can set off an ATWESS, MGSS or DIFCUE pyrotechnic cartridge. Treat ATWESS, MGSS and DIFCUE cartridges as standard ammunition.

- Hook and loop tape primer is toxic and highly flammable. Do not spray near heat, sparks, or open flame. Use only in well-ventilated areas.

CAUTION

- Any batteries or otherwise hazardous materials replaced as routine maintenance should be disposed of through local government personnel.

For information on **FIRST AID**, refer to **FM 21-11/MCRP-3-02G**.

HOW TO USE THIS MANUAL

INTRODUCTION.

This manual contains operation instructions for the Multiple Integrated Laser Engagement System (MILES 2000) Tactical Engagement Simulation System (TESS) when configured with the Main Gun Signature Simulator (MGSS).

MANUAL DESCRIPTION.

This manual is divided into three chapters. Chapters are further divided into sections. The chapter descriptions are provided in the following subparagraphs.

Chapter 1 is an introduction that provides general information, equipment description and data, and theory of operation.

Chapter 2 provides operating instructions.

Chapter 3 provides operator maintenance instructions.

Intentionally left blank.

CHAPTER 1
INTRODUCTION

SECTION I. GENERAL INFORMATION

1.1 SCOPE.

This manual describes how to install, operate, and maintain the Multiple Integrated Laser Engagement System (MILES 2000) Tactical Engagement Simulation System (TESS) when configured with the Main Gun Signature Simulator (MGSS). The manual also explains all authorized operator maintenance. Refer any maintenance problems not covered to organizational maintenance personnel.

1.2 MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those described by DA PAM 738-750, The Army Maintenance Management System (TAMMS). Marine Corps personnel will use TM 4700-15/1, Equipment Record Procedures, and refer to the on-line MCPDS or Marine Corps Stocklist SL-1-2, Index of Technical Publications.

1.3 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).

If your MILES 2000 equipment for the Main Gun Signature Simulator (MGSS) needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on a Quality Deficiency Report. Mail to us at Commander, Simulation, Training, and Instrumentation Command (STRICOM) ATTN: AMSTI-OPS-L; 12350 Research Parkway, Orlando, FL 32826-3276. We'll send you a reply. For U.S. Marine Corps personnel, submit SF-368 in accordance with MCO 4855.10 (Quality Deficiency Report) to: Commander, Marine Corps Logistics Base (Code G316-1), 814 Radford Boulevard, Albany, GA 31704-1128.

1.4 CORROSION PREVENTION AND CONTROL.

a. Corrosion Prevention and Control (CPC) of Army material is a continuing concern. It is important that any corrosion problems with this item be reported so the problem can be corrected and improvements can be made to prevent the problem in the future.

b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling or breaking of these materials may be a corrosion problem.

c. If a corrosion problem is identified, it can be reported using form SF-368. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will assure the information is identified as a CPC problem.

d. The form should be submitted to Commander, Simulation, Training, and Instrumentation Command (STRICOM) ATTN: AMSTI-OPS-L; 12350 Research Parkway, Orlando, FL 32826-3276. U.S. Marine Corps personnel, submit SF-368 in accordance with MCO 4855.10 (Quality Deficiency Report).

1.5 PREPARATION FOR STORAGE OR SHIPMENT.

When receiving equipment for storage or shipment, always inspect the returned equipment for damage, breaks, cracks, and cleanliness.

1.6 LIST OF ABBREVIATIONS AND GLOSSARY.

Refer to Table 1-1 for the list of abbreviations used with the MILES 2000 system, and refer to Table 1-2 for the glossary.

Table 1-1. List of Abbreviations

ASAAF	Automatic Small Arms Alignment Fixture
ATWESS	Anti-Tank Weapons Effects Signature Simulator
AVCPS	Audio Visual Cue Pyrotechnic Simulators
BIT	Built-In-Test
CD/TDTD	Controller Device/Training Data Transfer Device(Controller Gun)
CPC	Corrosion Prevention and Control
CU	Control Unit
CVS	Combat Vehicle System
DIFCUE	Direct/Indirect Fire Cue
DPCU	Data Processing Control Unit
EIR	Equipment Improvement Recommendation
FCU	Fire Control Unit
FlashWESS	Flash Weapons Effects Signature Simulator
FU	Firing Unit
IR	Infrared
ISU	Integrated Sight Unit
ITS	Independent Target System
IWS	Individual Weapons System
IWS Console (DPCU)	Individual Weapons System Console (Data Processing Control Unit)
KSI	Kill Status Indicator
LASER	Light Amplification by Simulated Emission of Radiation
LED	Light Emitting Diode
LU	Loader Unit
MARS	MILES After-Action Review System
MCS	Master Control Station
MG	Machine Gun
MGSS	Main Gun Signature Simulator
MILES	Multiple Integrated Laser Engagement System
O/C	Observer Controller
OTPD	Optical Turret Positioning Device
PID	Player Identification

Table 1-1. List of Abbreviations - Continued.

Pk	Probability of Kill
PMCS	Preventive Maintenance Checks and Services
PROM	Programmable Read-Only Memory
SAT	Small Arms Transmitter
SAWE	Simulated Area Weapons Effect
TAMMS	The Army Maintenance Management System
TESS	Tactical Engagement Simulation System
TNB	Turret Network Box
ULT	Universal Laser Transmitter

Table 1-2. Glossary.

Administrative Kill	A kill assessed by a Controller for administrative purposes.
Automatic Small Arms Alignment Fixture (ASAAF)	Device used to align the Small Arms Transmitter (SAT) to the sights on a weapon.
Catastrophic Kill	A kill that occurs from a combination of any two types of kills.
Cheat Kill	A kill is assessed to a system when a defined cheat is has been detected.
Commo Override	Use the Control Unit **USER INFO/ENTER** push button to override the communications disable function under Communications/ Catastrophic Kill conditions in an emergency.
Controller	An umpire or referee in a MILES 2000 training exercise.
Controller Device	A device used by the Controller to upload, download and test the MILES 2000 system.
Direct/Indirect Fire Cue (DIFCUE)	A device that produces flash, noise, and smoke to simulate a vehicle being hit by direct or indirect fire.
Fastener Tape	A hook and pile type tape used to hold vehicle detector belts and other MILES 2000 equipment in place.
Helmet Harness	The part of the IWS attached to the combat helmet.
Hit	Simulated contact with opposing fire that does not result in a catastrophic kill.
Individual Weapons System (IWS)	The helmet and torso assembly and IWS Console (DPCU), which is worn by personnel. This equipment also includes the Small Arms Transmitter (SAT).
Kill	Simulated contact with opposing fire that totally disables a vehicle or individual.
Kill Status Indicator (KSI)	A device attached to a vehicle that produces an external flashing light indicating a hit, near miss or kill.
LASER	Light Amplification by Simulated Emission of Radiation. A narrow beam of light capable of transmitting information.
Laser Beam	In MILES 2000 equipment, an eye-safe, invisible beam of light that simulates weapons fire.
Laser Detector	A device that senses incoming laser beams.
Laser Transmitter	A device that transmits a laser beam.

Table 1-2. Glossary - Continued.

Main Gun Signature Simulator (MGSS)	A device that produces a flash and bang to simulate main gun firing.
Near Miss	Laser fire close enough to be sensed by a laser detector, but not close enough to cause a hit or kill.
Optical Turret Positioning Device (OTPD)	A device that provides an optical reference signal to the turret detector belts (on applicable vehicles) to determine the turret position with reference to the hull.
Reset	Brings the system to the ready (alive) condition. In a CVS, the reset brings the system to a ready condition and returns ammunition to the default levels.
Resurrect	When a CVS is resurrected, the system is brought to a ready condition, but the ammunition levels remain as they were when the system was killed.
Small Arms Transmitter (SAT)	A laser transmitter used on various individual and vehicle-mounted rifles and machine guns.
Torso Harness	The part of the IWS that is worn on the upper body.
Weapon Token	Is embedded in software and allows the IWS Console (DPCU) to enable a SAT. The Weapon Token is transmitted to the IWS when the system is reset/resurrected by the CD/TDTD. The SAT cannot be enabled without a Weapon Token and will not have one in the following conditions: system is killed or another SAT is enabled with the same Torso Harness.

NOTE

Army vehicle kits contain the SATs for the vehicle mounted weapons, but do not include IWS SATs. Marine Corps vehicle kits do not include any IWS items.

1.7 SAFETY, CARE, AND HANDLING.

Before, during and after operation of equipment, read and adhere to all applicable WARNINGS and CAUTIONS. Perform all preventive maintenance checks and services as scheduled, and report any discrepancies as soon as possible. Use the proper tools and procedures for installation, troubleshooting, removal and replacement of components, and notify higher echelon maintenance personnel when warranted.

Although MILES 2000 consists of ruggedized equipment, designed to withstand extreme vibration, shock, and environmental stresses, treat the equipment with reasonable care; do not use excessive force when handling, packing, or stowing equipment. Responsible handling and use will help prolong the life cycle and appearance of the equipment.

CAUTION

Use of solvents may damage rubber seals on the MGSS. Use mild soap and water to components.

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1.8 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.
1.9

1.8.1 Equipment Characteristics. The MILES 2000 Main Gun Signature Simulator (MGSS), simulates the firing of the main gun on the battle tank during force-on-force training exercises. It consists of a Fire Control Unit (FCU), which has an LCD display for displaying all relevant operational information, and a Firing Unit (FU) which gets loaded with the Audio Visual Cue Pyrotechnic Simulators (AVCPS). AVCPS (M30) pyrotechnic cartridges must be used in the MGSS.

1.8.2 Capabilities and Features.

a. Easily installed.

b. Provides realistic firing capabilities of the 120 mm main gun by simulating the flash, bang, and smoke by pyrotechnic means.

c. Electrically initiated pyrotechnic.

d. 60 available rounds.

e. Automatic detection and display of available rounds.

f. Self-test (BIT) capability with fail safe shutoff.

g. Forced safety interlock during loading/unloading sequence.

1.9 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

The MILES Main Gun Simulator (MGSS), contains the following equipment:

a. MGSS FU. The FU contains up to 60 pyrotechnic cartridges. The MGSS FU is mounted externally and is located on the left forward side of the turret on the M1A1/M1A2.

b. MGSS FCU. The FCU provides the display for remaining activations and rounds fired. The MGSS FCU is mounted internally on the sidewall of the commander's station, near the MILES 2000 Control Unit (CU), on the M1A1/M1A2.

c. Mounting adapter, interconnect cables, DC Power Cable, Power Adapter Cable for Turret Network Box (TNB).

1.10 EQUIPMENT DATA.

Table 1-3 defines the equipment data.

Table 1-3. Equipment Data.

EQUIPMENT	WEIGHT (POUNDS)	DIMENSIONS L x W x D (INCHES)	NUMBER OF ROUNDS	NOTES
MGSS Firing Unit	56	17.7 x 14.2 x 8.3	60	
MGSS Fire Control Unit	1.5	4.5 x 4.5 x 2.5	NA	

SECTION III. THEORY OF OPERATION

1.11 BASIC PRINCIPLES OF OPERATION.

1.11.1 Basic Principles of Operation (MILES 2000). The MILES 2000 system uses laser beams to simulate actual weapons fire. An eye-safe invisible laser beam is sent out by each weapon's transmitter when it is fired. The laser beam is coded, and simulates all of the weapon's capabilities including range, accuracy, and destructive capability.

Laser detector systems are used to sense opposing fire. The detector systems register incoming laser beams and determine whether they have scored a near Miss, Hit, or Kill. Incoming fire can result in more than one type of a Hit or Kill. Types of Hits or Kills include Mobility, Communications, Firepower, or a Catastrophic Kill of the entire vehicle. A Catastrophic Kill will occur from a combination of any two types of Kills.

Table 1-4 defines the Kill Indication Chart.

Table 1-4. Kill Indication Chart.

Type of Hit/Kill	Number of KSI Flashes	Audible Indication
Vehicle		
SMAW Spotting Rifle	1 Flash	None
Near Miss	2 Flashes	Near Miss.
Hit	4 Flashes	Hit.
Mobility Kill	4 Flashes	Hit, Mobility. Stop Vehicle. (the crew has 20 secs to bring the vehicle to a stop)
Fire Power Kill	4 Flashes	Hit, Fire Power.
Communications Kill	4 Flashes	Hit, Commo Kill. (disables external communications only)
Catastrophic Kill	Flashes Continuously	Vehicle Kill
Administrative Kill	Flashes Continuously	Vehicle Kill
Cheat Kill	Flashes Continuously	Cheat Kill
Reset	1 Flash	Reset/Resurrect
IWS		
Near Miss	N/A	2 Beeps
Kill	N/A	Continuous
Administrative Kill	N/A	Continuous
Cheat Kill	N/A	Continuous
Reset	N/A	4 Beeps

Notes: Cheat Kill will occur during a Mobility Kill if the vehicle does not stop within the allotted 20 seconds or moves after it has stopped. A Cheat Kill will occur when disconnecting any of the following pieces of vehicle equipment: KSI, any Detector Belt/Array, or Power Controller (must be reconnected for cheat to be indicated), or removing the battery on IWS Console (DPCU).

In the event of a Catastrophic or Communications Kill, external communications can be over-ridden for **EMERGENCIES ONLY** by pressing the USER INFO push button on the Control Unit, selecting communication override and pressing the ENTER push button.

1.11.2 Principles of Operation Main Gun Signature Simulator (MGSS). The MGSS is used in the M1A1/M1A2 in order to simulate the firing of the main gun during force-on-force training exercises. The Firing Unit (FU) can hold up to 60 pyrotechnic cartridges, simulating the flash, smoke and bang created when the main gun is fired. Provided with common MGSS kit is a SAWE interface cable. The MGSS is a system installed as an option with MILES 2000.

With the MILES 2000 system, when the Universal Laser Transmitter (ULT) is fired to simulate the 120 mm main gun of the M1A1/M1A2 Abrams, the Control Unit (CU) commands the Kill Status Indicator (KSI) to activate the MGSS. The Audio Visual Cue Pyrotechnics Simulator (AVCPS) of the FU of the MGSS produces flash, bang, and smoke simultaneously. Immediately following the flash and bang is an outpouring of white smoke. This provides a realistic enactment of the actual main gun firing effects.

LOADING/UNLOADING (SAFE/ARM) INTERLOCK (FU) - Removes power when the Firing Unit is opened to load/unload. The Firing Unit, when closed, will reconnect the power circuitry only after being armed.

During MGSS operation, maintenance, or when personnel are in close proximity, extreme caution should be used. Personal Safe Distance is five (5) meters.

1.11.3 MGSS Configuration. The MGSS consists of the Fire Control Unit (FCU); the Firing Unit (FU); the FU mounting (vehicle specific) adapter; the AVCPS (M30 pyrotechnic simulator), which is loaded into the FU; a Power Supply Cable and a Power Adapter Cable, which connects the FCU to the vehicle 24 Vdc power source; a FCU/FU Interconnect Cable, which connects the FCU to the FU, (this cable provides a means by which the FCU can control the FU); and a KSI Trigger Cable, through which the Firing Unit can receive signals from the KSI. Additionally, a SAWE/MGSS trigger cable is provided with each kit.

Table 1-5 defines the Kit/Equipment List.

Table 1-5. Kit/Equipment List.

PACKAGE NOMENCLATURE: MAIN GUN SIGNATURE SIMULATOR, M1A1/A2				
PACKAGE PERTAINS TO: 148201-2				
PACKAGE CONTENTS				
QTY	NAME OF ITEM	DWG NO.	PART NO.	NOTES
1	MAIN GUN SIGNATURE SIMULATOR (MGSS)	148200	148200-2	1
1	CABLE ASSY-KSI TO MGSS, TRIGGER	146452	146452-1	
1	ADAPTER ASSEMBLY-MGSS, M1A1/A2	148202	148202-1	
1	TRANSIT CASE, MGSS, M1A1/A2	148204	148204-1	2
AR	OPERATOR'S MANUAL		TD-9-6920-892-10	
1	ADAPTER CABLE ASSY, POWER, DIFCUE/MGSS	148203	148203-1	
1	CABLE ASSY, TRIGGER TO MGSS/SAWE	148212	148212-1	3

NOTES:

1. SYSTEM (-2) INCLUDES THE FOLLOWING:
   FIRING UNIT (KEYLESS)
   FIRE CONTROL UNIT
   CABLE ASSY, DC PWR.
   CABLE ASSY, FCU/FU
   FASTENER TAPE (VELCRO PAD)

2. MARK THE TRANSIT CASE (2 PLACES) WITH THE APPLICABLE DASH NO. AFTER THE BASIC PART NUMBER. THE MARKING SHALL BE 6.35mm HIGH CHARACTERS, MINIMUM, COLOR WHITE, NO. 27925, IN ACCORDANCE WITH FED-STD-595. LOCATE AS SHOWN ON TRANSIT CASE DRAWING.

3. CABLE ASSEMBLY IS TO BE USED IN PLACE OF P/N 146452-1, CABLE ASSEMBLY, FOR SAWE OPERATIONS.

See Figures 1-1 and 1-2 located at the end of this table. See Figure 2-1 for MGSS Configuration.

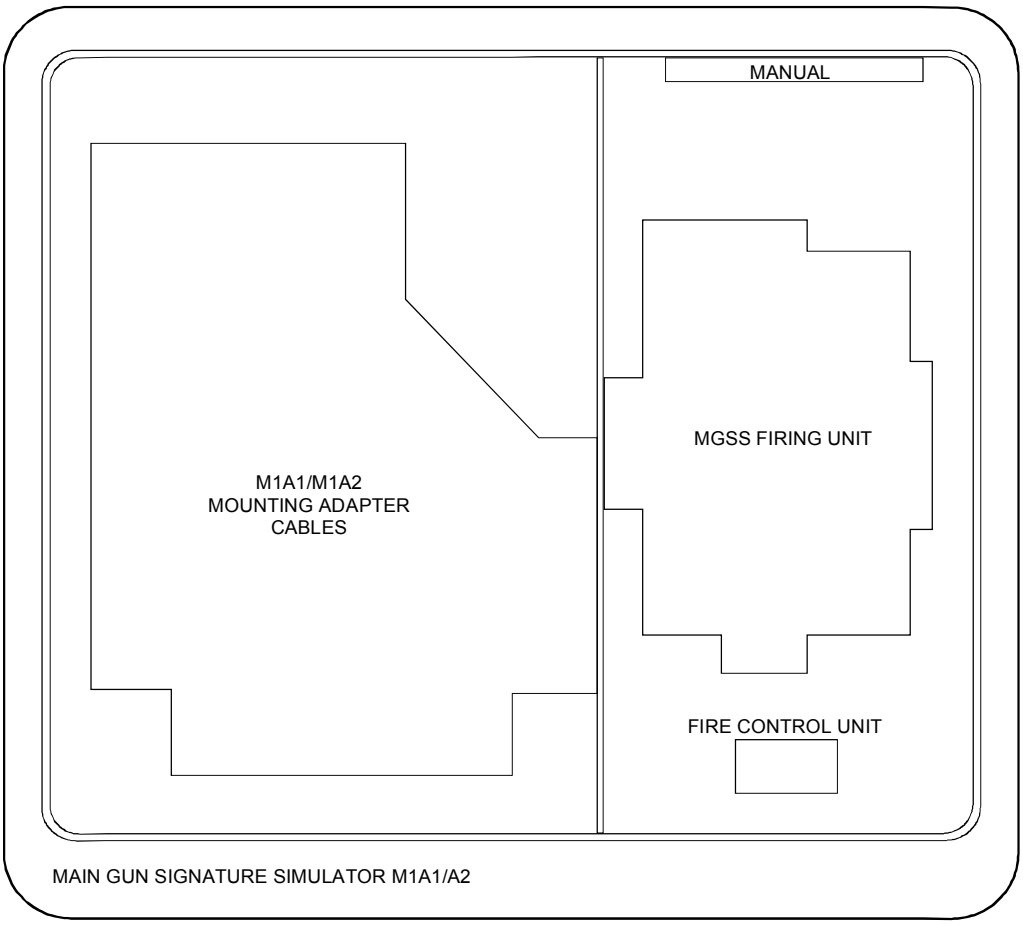


Figure 1-1. MGSS M1A1/A2 Transit Case.

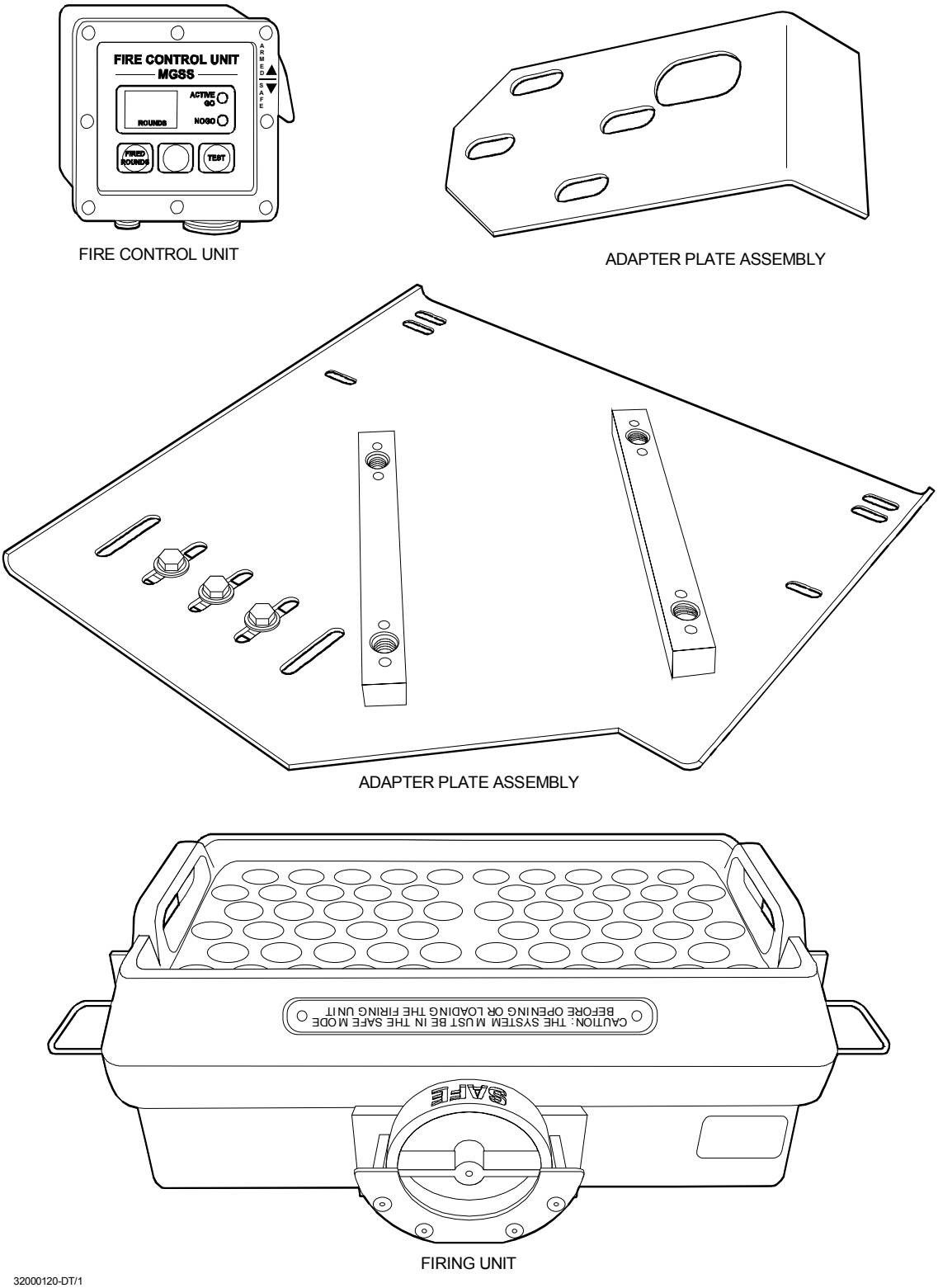


Figure 1-2. M1 MGSS System Components.

CHAPTER 2
OPERATING INSTRUCTIONS

SECTION I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

2.1 EQUIPMENT FIGURES AND TABLES.

The following figure, as listed in Table 2-1, illustrates and describe the MILES 2000 Main Gun Signature Simulator (MGSS) operating controls and indicators.

Table 2-1. Controls and Indicators Reference

ITEM	FIGURE NO.
Main Gun Signature Simulator (MGSS)	2-1

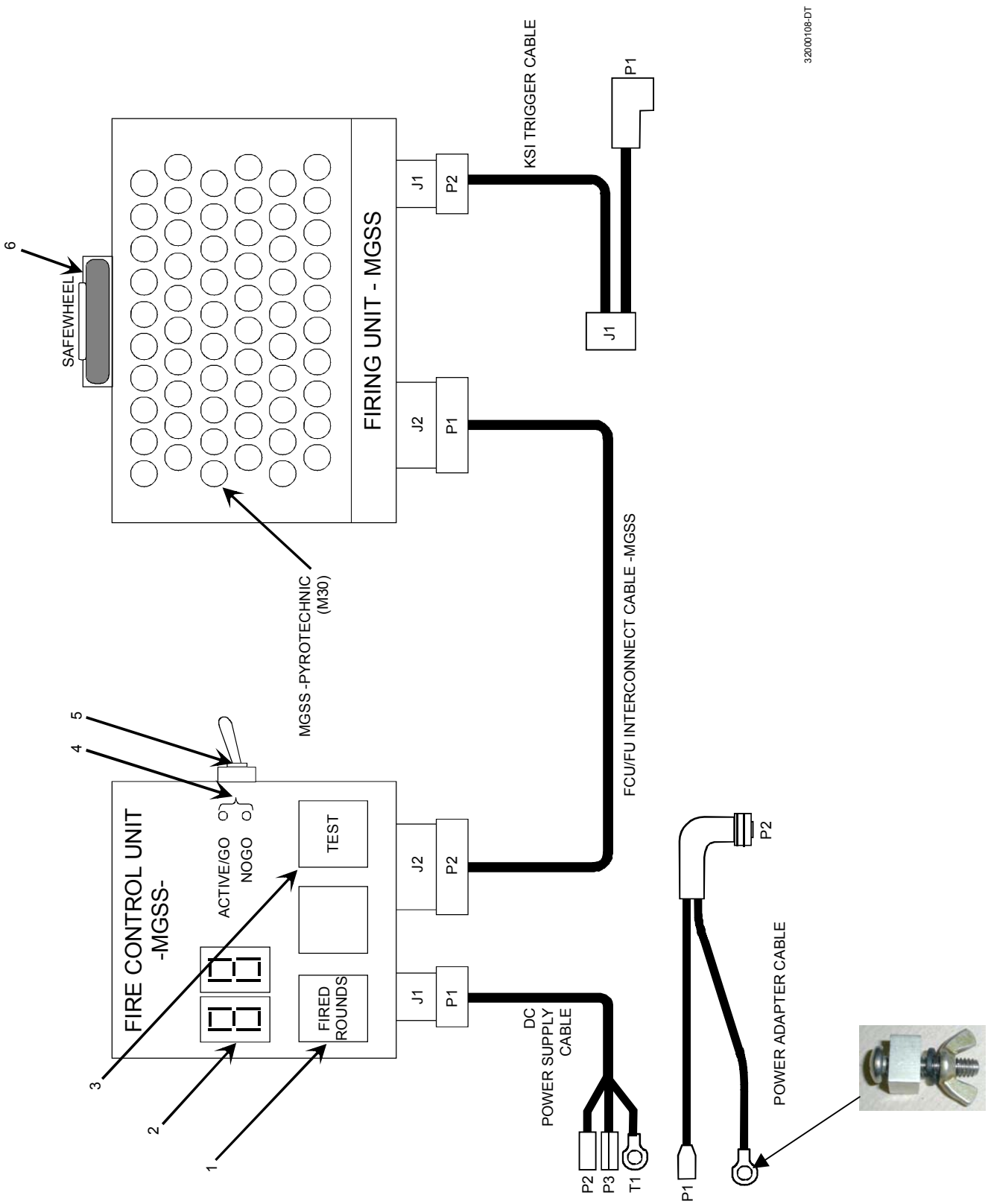


Figure 2-1. MGSS Configuration.

MGSS CONTROLS AND INDICATORS REFERENCE LIST (See Figure 2-1)

1. FIRED ROUNDS PUSH BUTTON. When pressed, indicates on the LED display the number of activations since loading. When released, indicates the number of AVCPS remaining.

2. LED DISPLAY. Indicates the number of remaining AVCPS and the number of AVCPS that have been activated since loading. If power is lost, the number of AVCPS that were activated since loading information will also be lost. May display an error code if a system malfunction is detected during operation.

3. TEST DISPLAY PUSH BUTTON. Initiates a "self test" of the MGSS. Results are displayed in the LED Display.

4. ACTIVE/GO, NO GO LEDs. Display BIT results and MGSS status. The Active/Go LED is green and the No Go LED is red.

5. MGSS SAFE/ARM TOGGLE SWITCH (FCU). To ensure safe operations and control of the MGSS FCU/FU, a safety interlock is provided in the design. Precludes inadvertent activation of the MGSS during loading and unloading. When the SAFE/ARM switch on the FCU is placed in the "SAFE" position, an internal switch is triggered which disconnects the power of the total MGSS system.

6. MGSS SAFE/ARM WHEEL (FU). Provides secondary SAFE/ARM functions and must be manually rotated to the safe position before the FU can be opened for loading/unloading. **DOES NOT** override the SAFE/ARM switch on the FCU.

SECTION II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Preventive Maintenance Checks and Services (PMCS) will ensure that the MILES 2000 equipment will be ready for operation and perform satisfactorily throughout its mission. Preventive maintenance checks consist of performing a systematic inspection to discover defects before they result in operational failure of the equipment. Defects or malfunctions discovered by the crew during use of the MILES 2000 equipment, or as a result of performing maintenance checks and services, will be reported using the proper forms.

2.2 INTRODUCTION TO PMCS TABLE.

Operator preventive maintenance checks and services are shown in Table 2-2. Tasks to be performed before operation appear in the "B" column under the heading "Interval"; tasks to be performed during operation are checked in the "D" column; tasks to be performed after operation are checked in the "A" column; tasks to be performed weekly are checked in the "W" column; and tasks to be performed monthly are checked in the "M" column.

NOTE

Within designated interval, these checks are to be performed in the order listed.

B - Before Operation
D - During Operation
A - After Operation
W - Weekly
M - Monthly

Table 2-2. Operator Preventive Maintenance Checks and Services

ITEM NO.	ITEM TO BE INSPECTED	INTERVAL B	D	A	W	M	PROCEDURES CHECK FOR AND HAVE REPAIRED	EQUIPMENT IS NOT READY/AVAILABLE IF:
1.	Firing Unit (FU)	√					Check AVCPS.	Pyrotechnics not loaded.
		√	√	√			Check contact plate area.	Wipe clean of debris using a clean cloth.
2.	Fire Control Unit (FCU)	√		√	√	√	Inspect for cracks in display window and push buttons.	Display window or push button cracked or broken.
			√				Check for display in display window when powered on.	No display in display window when powered on. Error codes displayed when powered on.
3.	Cable and Connector Assemblies	√		√	√	√	Check for damage to cable insulation.	Cable has excessive damage to cable insulation.
		√		√	√	√	Check connectors for bent or broken pins.	Connector has bent or broken pins.

SECTION III. OPERATION UNDER USUAL CONDITIONS

2.3 ASSEMBLY AND PREPARATION FOR USE.

Main Gun Signature Simulator (MGSS) components must be inspected and prepared as described in the following paragraphs prior to use.

2.3.1 Preparation for Use.

NOTE

When applying fastener tape, always apply the "hook" type tape to the holding surface (the surface to which an item will be installed), and the "pile" type tape to the item being installed. For example, when installing the Fire Control Unit (FCU) in the M1A1/ M1A2, you would apply the hook tape to the side wall of the commander's station, and the pile tape to the FCU. The FCU pile tape can then be attached to the sidewall hook tape, firmly securing the FCU.

a. Clean all areas where fastener tape is to be installed with water, a brush, if necessary, and rags. Tape will not adhere to a dirty or oily surface.

b. Mark areas where fastener tape is to be applied. Cut fastener tape to the appropriate lengths.

NOTE

You will need fastener tape to secure MGSS cables to keep them from interfering with operations. Read these installation instructions before you mark the areas designating fastener tape application. That way, you will be able to plan the cable routing and apply the fastener tape prior to installation.

WARNING

Tape primer is toxic and highly flammable. Do not spray near heat, open flame, or sparks. Use primer only in well-ventilated area. Do not permit smoking in the area.

c. Spray a heavy coat of tape primer on the cleaned areas along the strip where the fastener tape will be applied. Allow primer to dry thoroughly (follow directions on the primer can) before applying the fastener tape.

d. Cut tape as you need it for the installation procedure.

2.3.2 Pre-Installation Inspection.

a. Inspect the MGSS FU to ensure there is no dirt or sand in cartridge slots.

b. Inspect connectors for dirt, and bent or damaged pins on the MGSS FU and FCU.

c. Inspect the FCU display for cracks and/or broken push buttons.

d. Inspect the FCU connectors for dirt, and bent or damaged pins.

e. The FCU should have a strip of fastener tape applied to the back. If it doesn't, apply fastener tape as directed in the preceding instructions.

f. Inspect cable connectors for dirt, and bent or damaged pins.

g. Inspect cables for cracks, bent or damage exterior.

h. Replace and report damaged equipment as required.

2.3.3 MGSS Installation M1A1/M1A2.

2.3.3.1 Firing Unit Installation. (See Figure 2-2.)

a. On the left front corner of the turret, remove the smoke grenade launcher box by removing the four (4) bolts securing the box.

b. Save the bolts and store the box in a safe area as it will be reinstalled when the MGSS is removed from the vehicle.

c. Remove the four (4) 1 1/4-inch bolts from the left top corner of the turret. Save for MGSS adapter installation. (See Figure 2-3.)

d. Remove the two-part mounting adapter from the MGSS kit.

e. The vehicle mounting adapter is a two-piece assembly. Mount the large plate at the grenade launcher box location with the two bars facing outward. (See Figure 2-4.)

f. Align the slotted holes of the large plate with the bolt holes of the grenade launcher box. Secure the plate to the vehicle using the bolts from launcher box.

g. Place the smaller L-shaped part of the adapter on top of the turret; match the slotted holes of the L-shaped adapter with the holes on the turret; and secure with 1 1/4-inch bolts from step c. above.

h. The lip portion of the L-shaped part should project downward and fit under the clamp bar of the adapter plate. Tighten clamp bar after the plate and L-shaped part have been secured.

NOTE

Ensure MGSS FU Safe Arm Wheel is in safe position (Green is showing).

i. After opening the Firing Unit (FU), use the four (4) bolts provided with the MGSS to secure the MGSS FU to the bars on the mounting adapter. The cable connectors of the MGSS should face forward on the vehicle. (See Figure 2-5)

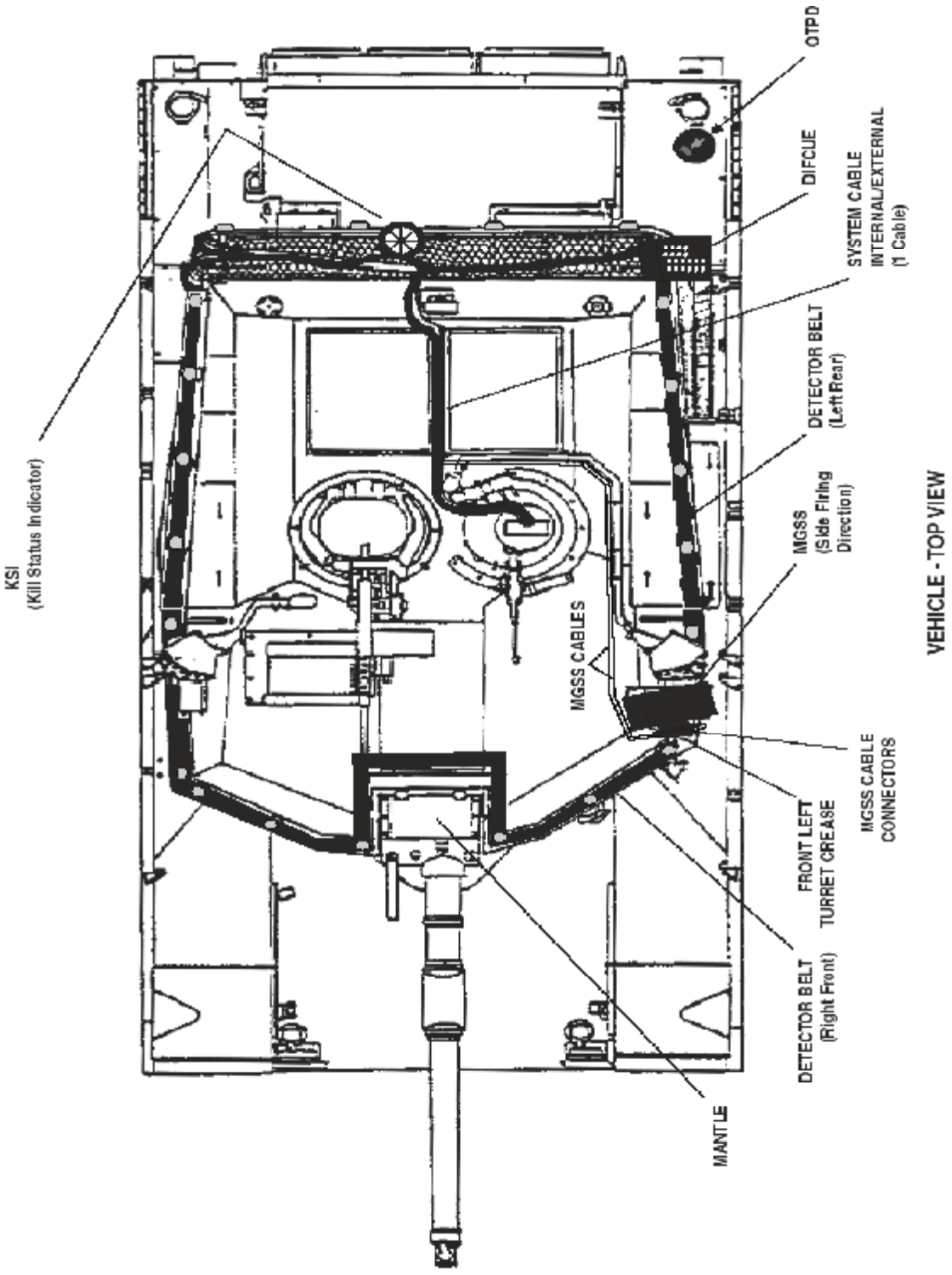


Figure 2-2. MGSS Firing Unit Installation.

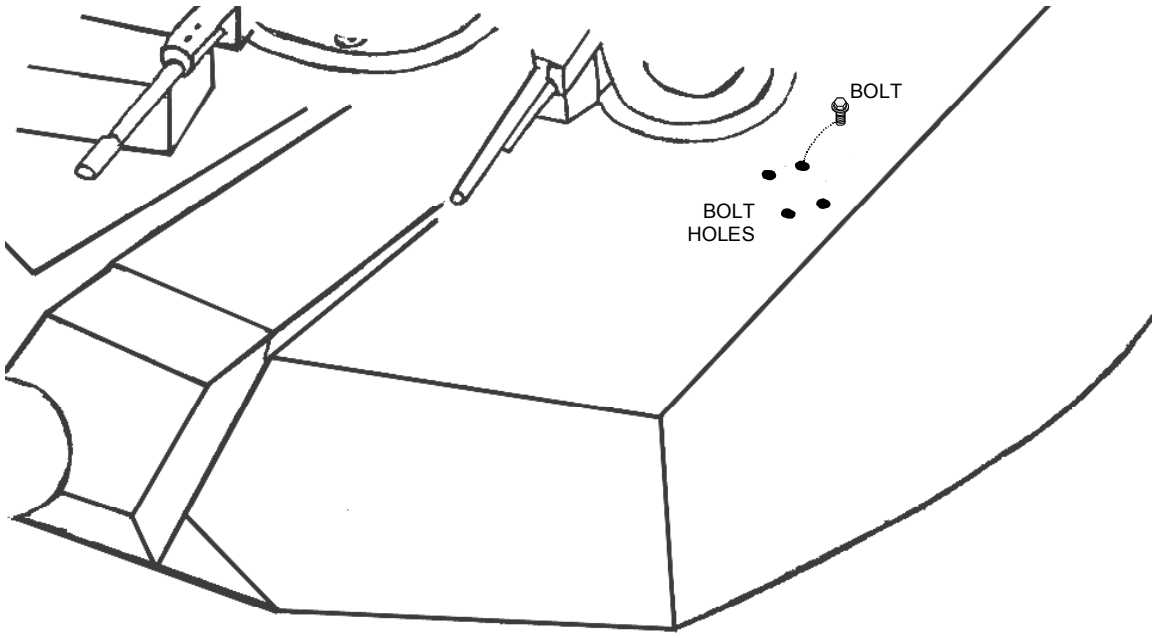


Figure 2-3. Bolt Removal.

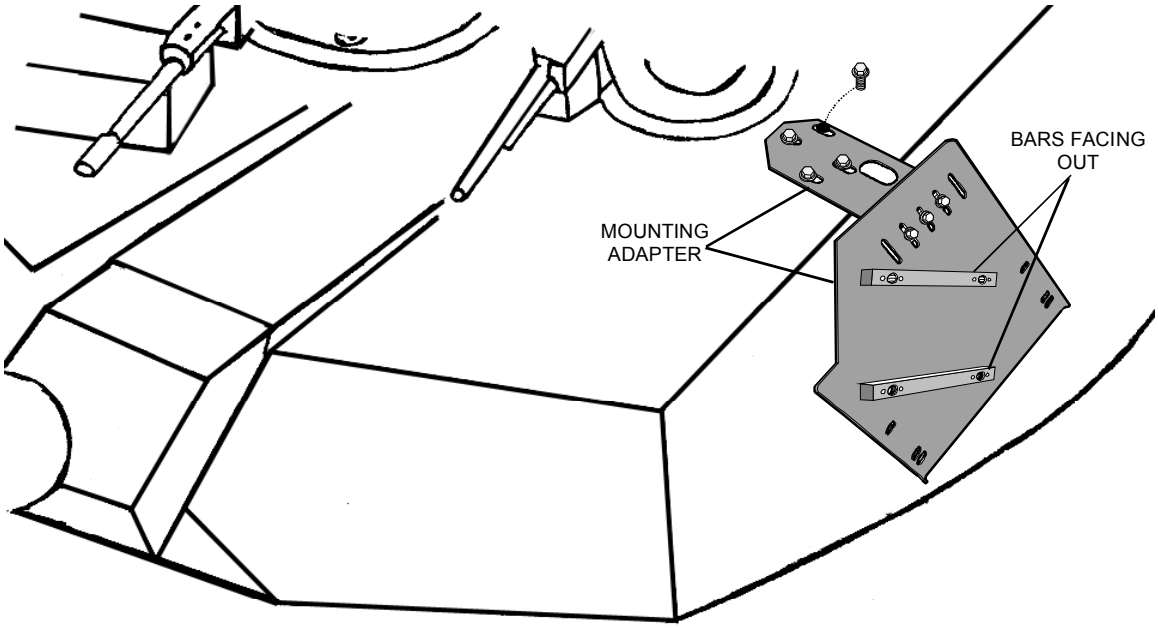


Figure 2-4. Mounting Adapter.

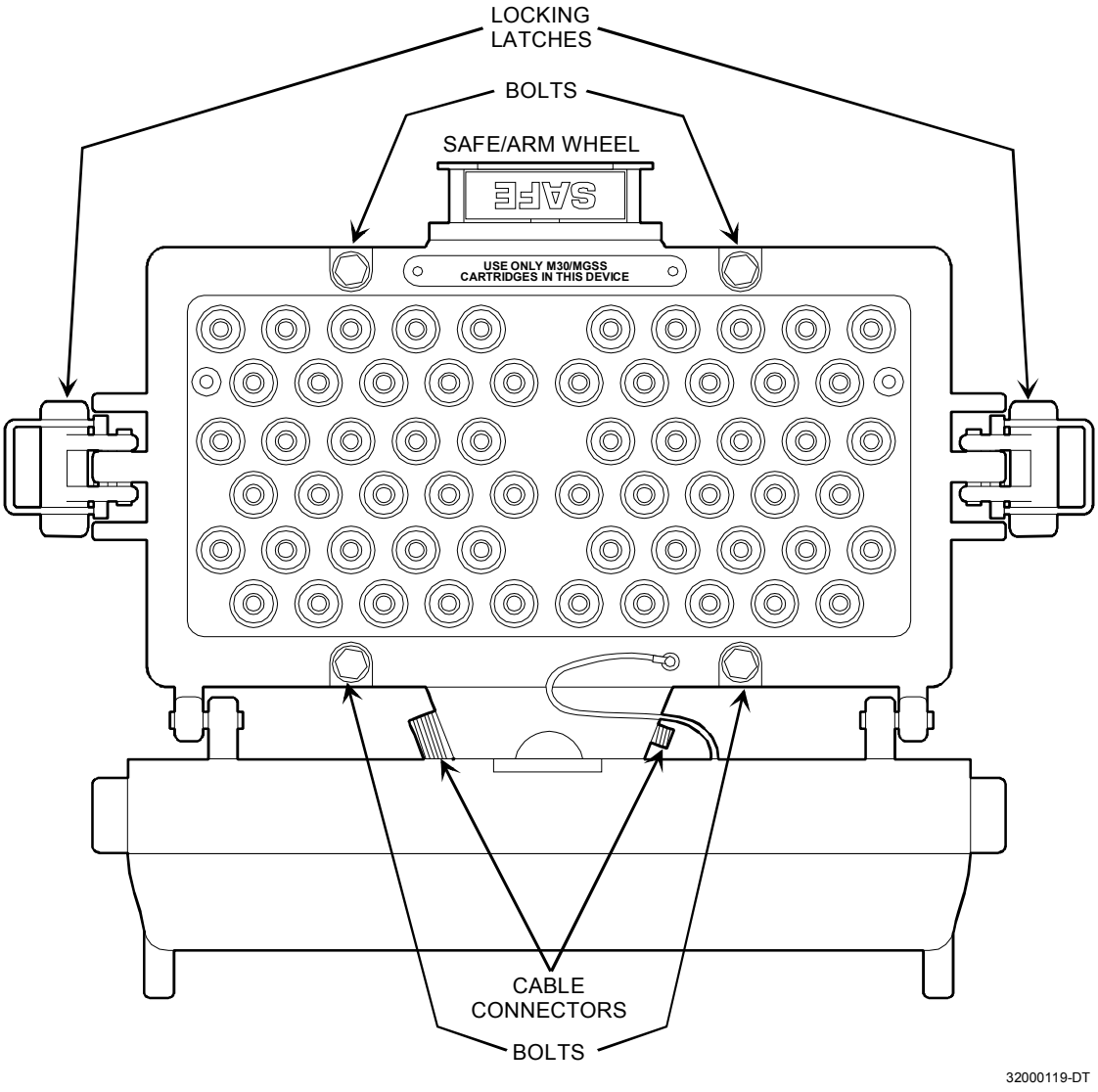


Figure 2-5. MGSS FU Mounting.

NOTE

Cable segments are labeled with "P" (plug) and "J" (jack) designators as shown in the following example: "P1/J2," where P1 indicates that the connector of that cable segment is plug #1, and J2 indicates the routing destination, jack #2, of the equipment/cable to which the cable segment is being routed. The installation instructions of this manual identify the equipment/cable to which each cable segment is to be routed.

j. Attach (P1) of the FCU/FU Interconnect Cable to (J2) of the FU. Attach (P2) of the KSI Trigger Cable to the FU and route the Interconnect Cable through the loader's hatch vision block grommet. (See Figure 2-1.)

k. Route the two (2) remaining segments of the KSI Trigger Cable (J1/P3) and (P1/J1) to the KSI.

k. Connect (P1) of the KSI Trigger Cable to (J1) of the KSI.

NOTE

Ensure the cables are out of the way and secured with fastener tape at frequent intervals.

m. If there will be a DIFCUE installed, connect (J1) of the MGSS KSI Trigger Cable to (P1) of the DIFCUE KSI Trigger Cable. (See Figure 2-6.) If there will not be a DIFCUE installed, connect (J1) of the KSI Trigger Cable to (P3) of the MILES 2000 System Cable [(P3) of the system cable will be labeled KSI].

2.3.3.2 <u>Fire Control Unit FCU Installation</u>.

a. Make sure there is fastener tape applied to the back of the FCU. Also ensure that there is fastener tape applied inside the turret on the right wall of the gunner's station. If there is none, apply the tape as instructed in paragraph 2.3 above.

b. Attach the FCU to the right sidewall of the commander's station. (See Figure 2-7.)

c. Attach (P2) of the FCU/FU Interconnect Cable to (J2) of the FCU. Attach (P1) of the DC Power Cable to (J1) of the FCU. Ensure cables are secured out of the way with fastener tape. (See Figure 2-1.)

d. Route the other end of the DC Power Cable (the end with the terminal lug , the booted plug, and the booted receptacle) to the Power Adapter Cable supplied with the MGSS kit. Connect P2 of the Power Adapter Cable to the 24 Vdc of the Turret Network Box. An alternate source of power is to connect the DC power supply cable to the dome light. (See Figure 2-8.)

NOTE

If DIFCUE is also installed, only one Power Adapter Cable is required for both devices. This is accomplished by connecting all three ground lugs together. Connect either MGSS or DIFCUE booted plug to Power Adapter Cable booted receptacle; then connect MGSS and DIFCUE booted plug/receptacle together, leaving one booted receptacle unconnected. Be certain the unconnected booted receptacle will not make electrical contact with any vehicle metal surface. (See Figure 2-9.)

<u>CAUTION</u>

If the boot on the receptacle is damaged and the receptacle does make electrical contact with any vehicle metal surface, there is a possibility of shorting out the vehicle system or possible vehicle circuit breaker failure.

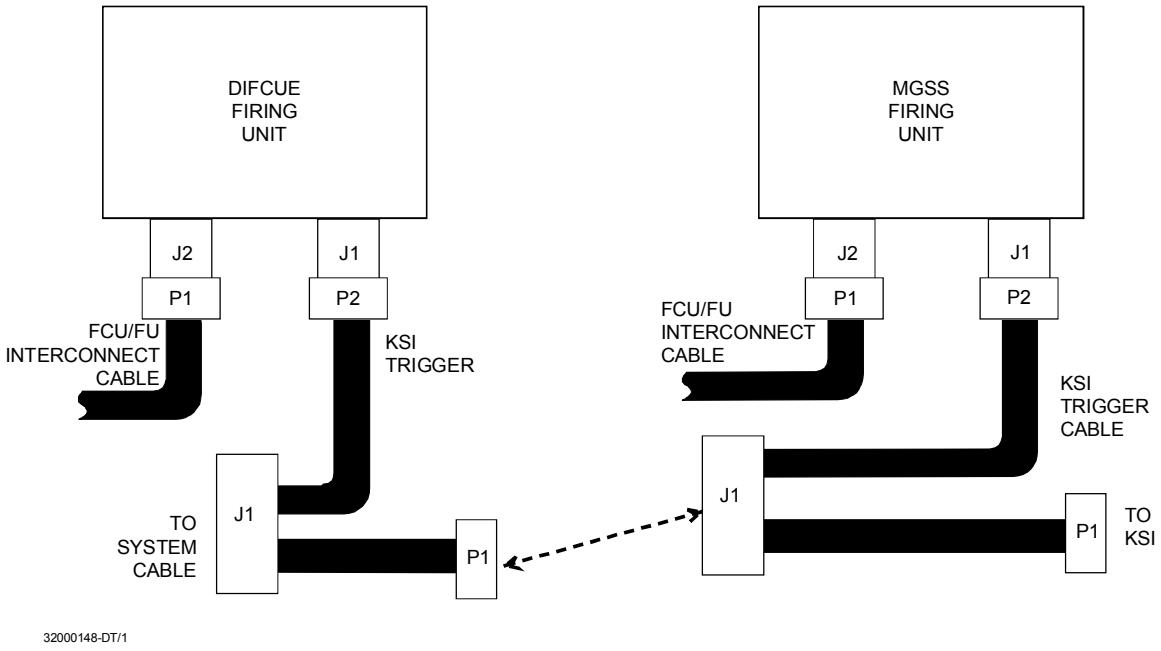


Figure 2-6. MGSS with DIFCUE Installed.

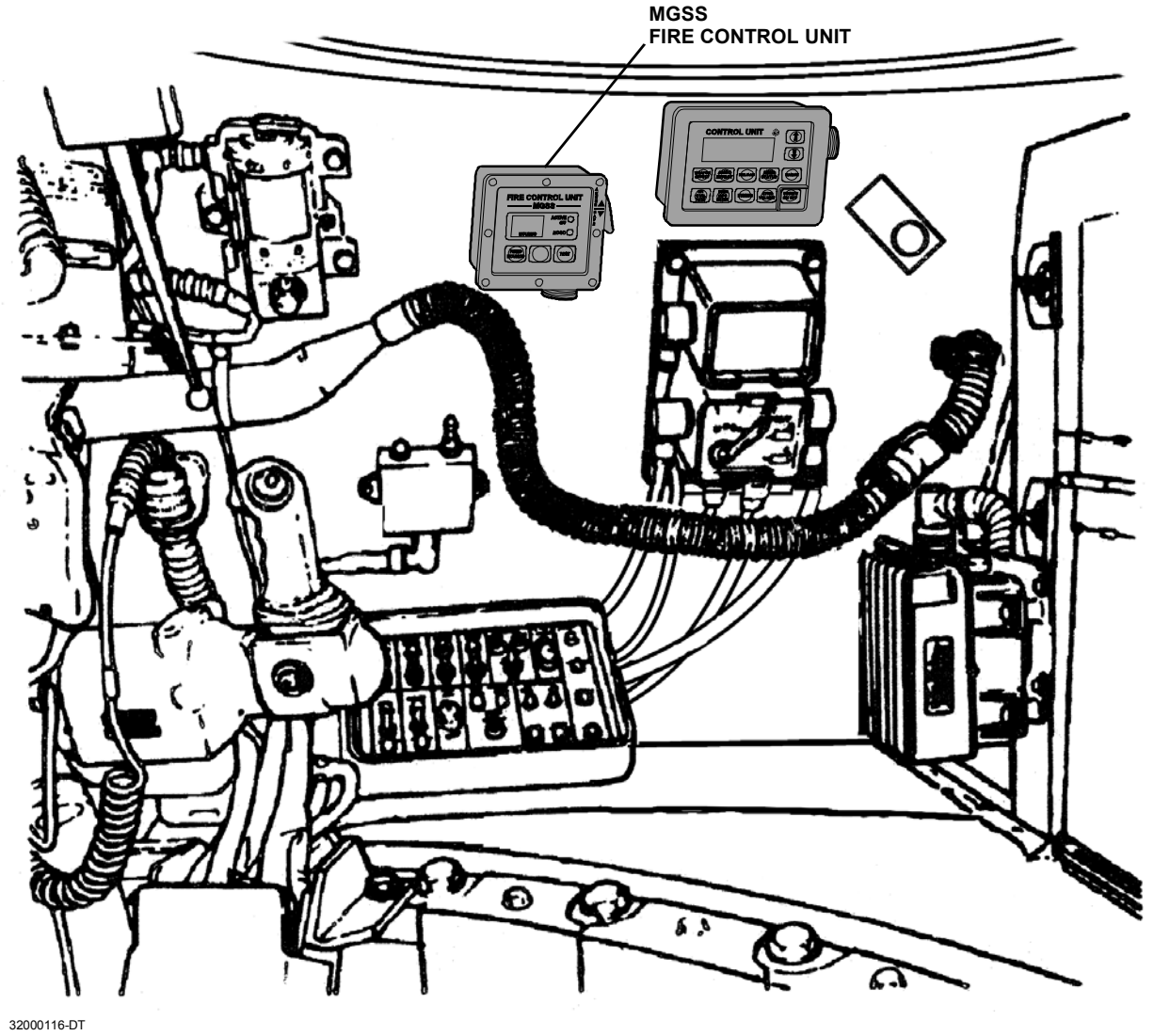


Figure 2-7. MGSS Fire Control Unit.

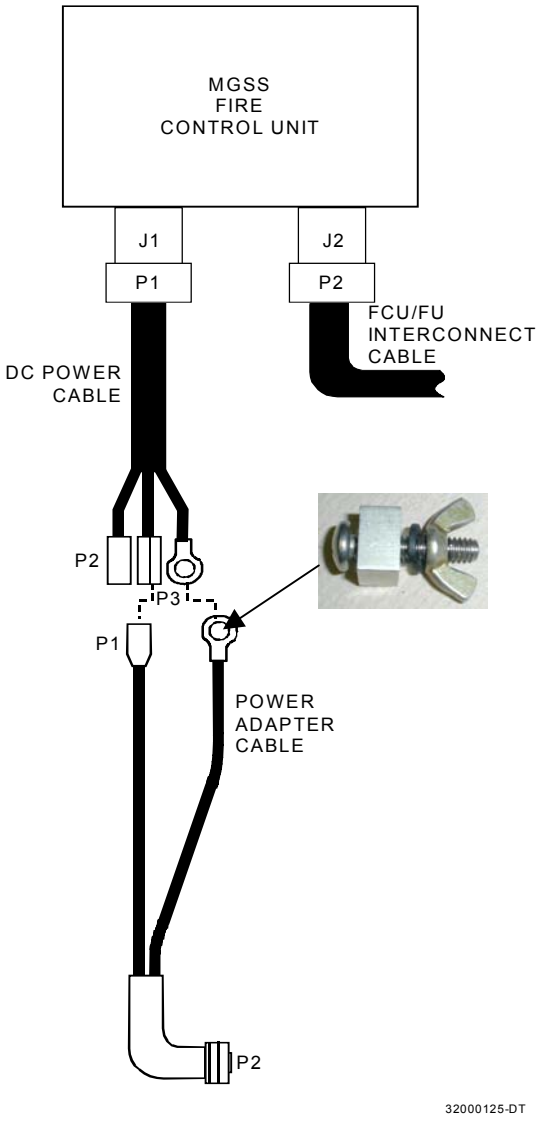


Figure 2-8. MGSS DC Power Cable to Power Adapter Cable.

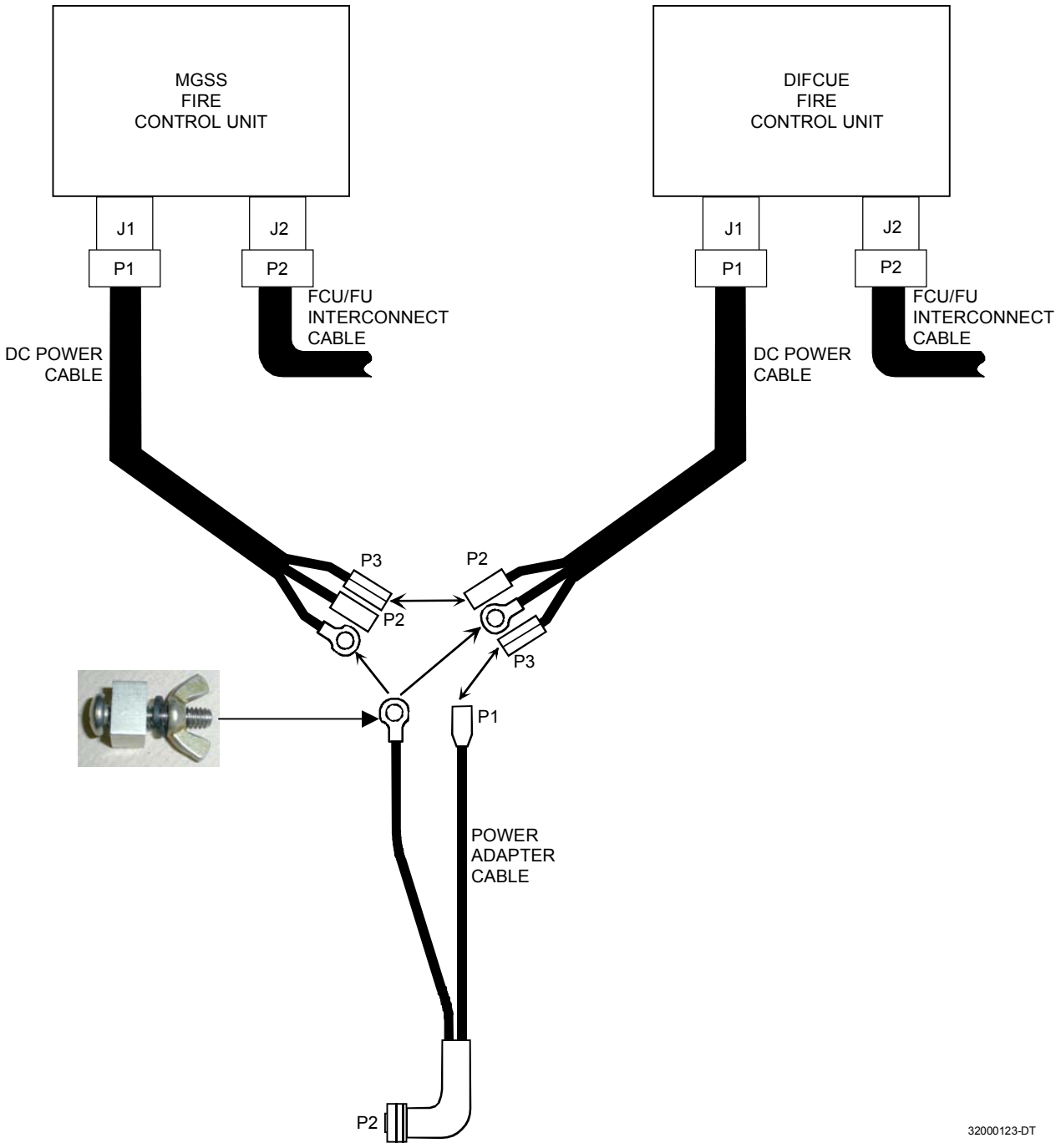


Figure 2-9. MGSS and DIFCUE Power Cables to Power Adapter Cable.

2.4 INITIAL ADJUSTMENTS, BEFORE USE, DAILY CHECKS, AND SELF-TEST REQUIREMENTS.

WARNING

To prevent personal injury, do not load or attempt to fire the MGSS in a staging area. The MGSS should only be loaded and tested in an area suitable for the activation of pyrotechnics.

After the MGSS is installed on the vehicle, the pyrotechnic cartridges (M30) must be loaded into the Firing Unit (FU), and the self-test (BIT) must be run. To complete these requirements, perform the following steps:

a. Turn tank Master Power off.

b. Place the MGSS FCU SAFE/ARM toggle switch to the "SAFE" (down) position.

c. Turn the MILES 2000 Control Unit (CU) Off or disable the MGSS at the MILES 2000 CU.

d. Approach the FU from the opposite side of the direction of fire.

e. Rotate the MGSS FU SAFE/ARM wheel to the "SAFE" position.

f. After lifting the handles on each side, open the cartridge carrier of the FU. Load the pyrotechnic cartridges. Only MGSS (M30) white smoke pyrotechnic cartridges should be loaded in this device.

g. Close the cartridge carrier of the FU and lock it with the handles on each side.

h. Turn the tank Master Power on.

i. Staying out of the firing path of the FU, enable the FU by turning the safety wheel to the "ARMED" position.

j. Place the FCU SAFE ARM toggle switch to the "ARMED" (up) position.

k. Once the MGSS is armed, it will perform a Built-In-Test (BIT). The FCU will display the results with a "GO" (green) LED or "NO GO" (red) LED as indicated in Table 2-3 in Section V of this chapter. After BIT passes the FCU will count the number of rounds, then display the number present.

l. Turn on MILES 2000 Control Unit (CU). Once CU is turned on, it will run BIT and the Observer/Controller must reset system with the CD/TDTD Controller Gun.

m. Return the FCU SAFE ARM toggle switch to the "SAFE" position.

2.5 OPERATING PROCEDURES.

a. Once the MGSS is loaded, armed, and has passed both the BIT and the functional checks (Section V), it **must be** enabled at the MILES 2000 Control Unit (CU). To enable the MGSS, perform the following procedures:

NOTE

The MGSS cannot be enabled at the MGSS FCU.

(1) Ensure the MILES CU display is at the default screen.

(2) Press the USER Info pushbutton.

(3) The CU will display the following choices:

MGSS - Disabled
DIFCUE - Disabled

(4) Use the Arrow pushbuttons to move the cursor on the CU to "MGSS - Disabled" and press the USER Info push button.

(5) The CU display status should change to "MGSS Enabled." The display will then automatically return to the default screen.

NOTE

If the CU is turned off and then turned back on, the MGSS must be enabled again per the instructions above.

b. During operation, the number of rounds remaining will be indicated on the LED display on the FCU.

c. Pressing and holding the Fired Rounds push button at the FCU will indicate the number of rounds fired since last "power on". The FCU display will continue this indication until the push button is released.

SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2.6 ASSEMBLY AND PREPARATION FOR USE UNDER UNUSUAL CONDITIONS.

2.6.1 Unusual Environment/Weather. The MILES 2000 equipment is ruggedized to withstand extreme changes in temperature, terrain, and environment. Therefore, assembly and preparation in unusual environment/weather should only require the caution necessary to ensure the safety of the operators and other participants.

2.6.2 Fording and Swimming. The MILES 2000 equipment is waterproof and ruggedized. Therefore, equipment transport which requires fording and/or swimming should only require caution necessary to safeguard operators and participants, and to maintain control and accountability of the equipment.

2.6.3 Emergency Procedures. The MILES 2000 equipment requires no additional procedures for emergency situations, as the equipment has been developed to be used for training simulations encompassing a great variety of conditions and levels of threat.

SECTION V. FUNCTIONAL CHECKS

2.7 FUNCTIONAL TEST PROCEDURES.

The functional check for MGSS equipment is accomplished by the Built-In-Test (BIT) performed by the Fire Control Unit (FCU). The FCU will run the BIT, and the F CU display screen will stay lighted during the test. Once the test has been run, the FCU will display the results on the screen. Table 3-1, Chapter 3, in Section I, Troubleshooting contains the list of possible error messages the FCU may display with Main Gun Signature Simulator (MGSS) equipment.

2.7.1 Built-In-Test (BIT). Once the MGSS is armed, it will perform a BIT. The FCU will display the results with a "GO" (green) LED and a "NO GO" (red) LED as indicated in table 2-3:

Table 2-3. MGSS FCU Display Chart

"GO" (GREEN) LED RESULTS	"NO GO" (RED) LED RESULTS	INDICATION/ACTION
Continuous green after BIT.	Not lighted after BIT.	BIT PASS - proceed with mission.
Continuous green during system operation.	Not lighted during system operation.	ACTIVE - Equipment is supplied by vehicle power - continue mission.
Not lighted after BIT.	Continuous red after BIT.	BIT FAIL - Refer to Chapter 3, Section 1, Troubleshooting Procedures.

2.7.2 Post BIT Functional Tests. If the BIT is successful, perform the following functional tests to ensure proper operation of the MGSS.

a. Look at the Fired Rounds display and ensure that the actual load status is detected.

b. Verify clear safety distance for personnel near MGSS Firing Unit. Fire a simulated round IAW the M1A1/A2 Manual TM 9-2350-264-10, firing procedure. The MGSS should fire a pyrotechnic cartridge; there should be a flash, bang, and smoke.

c. The FCU should decrease a round from the Fired Rounds display.

2.7.3 Abnormal Results from Functional Tests. If at any time during functional testing abnormal results are encountered, write down the abnormal indications and proceed to Chapter 3, Section I, Troubleshooting Procedures.

CHAPTER 3
OPERATOR MAINTENANCE INSTRUCTIONS

SECTION I. TROUBLESHOOTING

3.1 TROUBLESHOOTING PROCEDURES.

The following are troubleshooting procedures for problems which may be encountered with the MILES 2000 Main Gun Signature Simulator (MGSS) operation. Operator troubleshooting procedures involve identifying a problem and isolating the problem to the most likely piece(s) of equipment. Generally the Built-In-Test (BIT) run by the MILES Control Unit (CU) identifies most problems within the MILES 2000 system and produces an error message to let the user know there is a problem. However, with the MGSS, the MILES 2000 CU will indicate only if the MGSS is on-line (enabled) or not on-line. The BIT run by the MGSS Fire Control Unit (FCU) will indicate if the MGSS system is operational or non-operational. However, operator troubleshooting is neither extensive nor difficult. Table 3-1 lists problems that may be encountered, as well as possible solutions. You may notice that, much of the time, the corrective action to be taken to resolve a problem is to remove the malfunctioning equipment and replace it with a unit that is working. This is because the MILES 2000 is designed to need only limited maintenance at the operator and/or unit level. When the removal and replacement of equipment can be efficiently expedited, "down time" can be dramatically reduced and participants can quickly return to the mission scenario, allowing them to receive maximum benefit from training. Removal and replacement procedures are located in the applicable technical manual for your vehicle configuration. A chart referencing each configuration and the corresponding technical manual can be found in Section II, Operator Maintenance.

You may encounter equipment problems not addressed in this section. If this is the case, notify the appropriate personnel (a supervisor and/or higher echelon maintenance personnel) as soon as possible.

WARNING

Always remove power at the Control Unit (CU) before performing troubleshooting operations. Once power is restored at the CU, the MGSS must be enabled again.

Table 3-1. MILES 2000 Troubleshooting Chart for MGSS (See Figure 2-1.)

PROBLEM	ACTION		RESULT	NEXT STEP
BIT Fail Error codes appear in FCU display.	Step 1:	Retest.	BIT Pass. BIT Fail.	Continue the mission. Go to Step 2.
Some error codes may be corrected. See further this table.	Step 2:	Check that all cables are connected securely.	Connection(s) are loose or disconnected.	Tighten or reconnect securely, retest. If problem is fixed, continue mission. If not, go to Step 3.
	Step 3:	Remove and replace Interconnect Cable and retest.	BIT Pass. BIT Fail.	Continue with mission. Go to Step 4.
	Step 4:	Remove and replace KSI Trigger Cable and retest.	BIT Pass. IWS Console (DPCU) Fail.	Continue with mission. Go to Step 5.
	Step 5:	Remove and replace Firing Unit (FU). Load and arm per Operating Instructions, then retest.	BIT Pass. BIT Fail.	Continue with mission. Go to Step 6.
	Step 6:	Remove and replace Fire Control Unit (FCU). Arm per Operating Instructions and retest.	BIT Pass. BIT Fail.	Continue with mission. Notify supervisor or higher maintenance echelon.
LED/Displays do not light	Step 1:	Check that Power Supply cable is connected securely, then retest.	LED/Displays light. LED/Displays do not light.	Continue with mission. Go to Step 2.
	Step 2:	Ensure SAFE/ARM wheel is in the “ARM” position.	LED/Displays light. LED/Displays do not light.	Continue with mission. Go to Step 3.
	Step 3:	Remove and replace Power Supply Cable, then retest.	LED/Displays light. LED/Displays do not light.	Continue with mission. Go to Step 4.
	Step 4:	Remove and replace FCU, then retest.	LED/Displays light. LED/Displays do not light.	Continue with mission. Notify supervisor or higher maintenance echelon.

Table 3-1. MILES 2000 Troubleshooting Chart for MGSS-Continued.

PROBLEM	ACTION		RESULT	NEXT STEP
Incorrect rounds count/ display Ex: 60 AVCPS loaded and MGSS FCU displays 59.	Step 1:	System will operate but condition should be corrected. Most probably due to bad AVCPS contact. Put system in SAFE mode, open FU, check all AVCPS' for proper loading. Wipe any debris from contact areas. Rearm system.	Correct rounds count. Incorrect rounds count.	Continue with mission. Continue with mission. Remove undetonated cartridge and place in a pile. Contact Explosive Ordnance Disposal (EOD) team for pick up.
MGSS does not fire	Step 1:	Check that all cables are connected securely.	Connection(s) are loose or disconnected. Connections are secure.	Tighten or reconnect securely, retest. If problem is fixed, continue mission. If not, go to Step 2. Go to Step 2.
	Step 2:	Check FCU display to see if rounds (AVCPS) are available.	Display indicates rounds are available. Display indicates no rounds available.	Go to Step 3. Go to Step 3.
	Step 3:	Place FCU on SAFE and FU on SAFE, then using extreme caution to stay out of the path of fire, check to see that there are rounds loaded in the FU.		Remove and replace the FCU. Load rounds and arm the FCU and the FU; retest. If problem is not fixed, go to Step 5. See Warning & Note. Remove and replace the FCU. Load rounds and arm the FCU and the FU; retest. If problem is not fixed, go to Step 5. Go to Step 4. Load rounds and arm the FU, ensure the FCU is armed; retest. If problem is not fixed, go to Step 5.

WARNING

Ensure MILES 2000 CU has been turned off and remains off until all remove and replace procedures have been completed.

Table 3-1. MILES 2000 Troubleshooting Chart for MGSS-Continued.

PROBLEM	ACTION		RESULT	NEXT STEP
	Step 4:	Using extreme caution to stay out of the path of fire, check to see that the "MGSS SAFE/ARM" switch on both the FU and the FCU are turned to "ARM."	One or both switches is not armed. Both switches are armed.	Using Operating Instructions in Chapter 2, arm the FU and/or the FCU. See Note. Go to Step 5.
	Step 5:	Load round (ammo) at the Loader Unit. Enable MGSS at the Control Unit (CU). Test fire, ensuring the CU shows a firing event.	MGSS fires. MGSS does not fire.	Continue with mission. Go to Step 6.
	Step 6:	Remove and replace Interconnect Cable and retest.	MGSS fires. MGSS does not fire.	Continue with mission. Go to Step 7.
	Step 7:	Remove and replace KSI Trigger Cable and retest.	MGSS fires. MGSS does not fire.	Continue with mission. Go to Step 8.
	Step 8:	Remove and replace FU. Load and arm per Operating Instructions, then retest.	MGSS fires. MGSS does not fire.	Continue with mission. Go to step 9.
	Step 9:	Remove and replace FCU. Arm per Operating Instructions and retest.	MGSS fires. MGSS does not fire.	Continue with mission. Notify supervisor or higher maintenance echelon.
Error Code "27" appears on display.	Step 1:	Place FCU on SAFE and FU on SAFE. Using extreme caution, open the FU and remove all expanded (fired) pyrotechnic cartridges. Fired cartridges will be evident by open and blackened top cap. Remove all expended (fired) pyrotechnic cartridges.	MGSS fires. MGSS does not fire.	Continue with mission. Go to Step 2.
MGSS does not fire, error code displayed, "NO-GO" indicator illuminated.	Step 2:	Reset system at FCU by switching the SAFE/ARM switch to SAFE, then back to ARM.	Normal operation returns. Error code persists.	Continue with mission. NOTE: If error code "09" appears, see paragraph 2.7.2. Go to Step 3.

Table 3-1. MILES 2000 Troubleshooting Chart for MGSS-Continued.

PROBLEM	ACTION		RESULT	NEXT STEP
	Step 3:	System will run BIT. If error code persists remove and replace FU. Load and arm new FU per operating instructions.		
Error Code "15" appears on display. Indicates that SAFE wheel has been turned without following the correct SAFE procedure.	Step 1	Place SAFE/ARM switch at FCU to SAFE. Check SAFE wheel at FU (ARMED position). Rearm system at FCU by switching to "ARMED" position.	Normal operation returns. Error code persists.	Continue mission. Go to step 3 above.

SECTION II. OPERATOR MAINTENANCE

3.2 OPERATOR MAINTENANCE PROCEDURES.

With the exception of ensuring connections are secure and other types of preventive maintenance, operator maintenance for the Main Gun Signature Simulator (MGSS) consists of wiping debris from the FU contact area and/or removing the defective item and replacing it with functioning equipment. Remove/replace procedures for the M1A1/M1A2 configurations are included below:

3.2.1 Remove/Replace Procedures for M1A1/M1A2. Before conducting any Remove/Replace Procedures, turn **ALL** power OFF.

3.2.1.1 MGSS Firing Unit (FU) Removal.

a. Place the MGSS Fire Control Unit (FCU) SAFE/ARM toggle switch to the "SAFE" (down) position.

b. Approach the FU, staying out of the firing path.

c. Place the MGSS FU SAFE/ARM wheel to the "SAFE" position.

d. Disconnect the interconnect cable and the KSI Trigger Cable at the FU.

e. After lifting the handles on each side, open the cartridge carrier of the FU. Unload any remaining pyrotechnic cartridges. Ensure ALL pyrotechnic cartridges have been removed.

f. With cartridge carrier of FU open, remove the retaining bolts securing the FU to the mounting adapter and remove the FU from the adapter.

g. Close the cartridge carrier of the FU and lock it with the handles on each side. Turn the SAFE/ARM key to the "ARM"(up) position.

h. Clean equipment and prepare for turn in.

3.2.1.2 MGSS FU Replacement.

a Position the FU on the mounting adapter so that the MGSS firing direction is forward and upward, and MGSS connector block is facing forward.

b. Open the cartridge carrier and using the four (4) bolts provided with the adapter, secure the MGSS FU to the mounting adapter. The cable connectors of the MGSS should face forward.

c. Attach the Interconnect and KSI Trigger Cables to the FU connectors.

3.2.1.3 MGSS FCU Removal.

a. Disconnect the DC Power Supply and FCU/FU Interconnect Cables from the FCU connectors.

b. Remove the FCU from the fastener tape on the commander's station wall.

c. Clean equipment and prepare for turn in.

3.2.1.4 MGSS FCU Replacement.

a. Attach the FCU to the wall of the gunner's station.

b. Attach the FCU/FU Interconnect and DC Power Cables to the FCU connectors.

3.2.1.5 DC Power Cable Removal.

a. Disconnect the (DC) Power Cable from the FCU and from the dome light.

NOTE

On M1A1/A2 vehicles, disconnect the Power Adapter Cable at the Turret Network Box (TNB).

b. Undo all fastener tape retaining the cable and remove the cable.

c. Clean cable/connector(s) and prepare for turn in.

3.2.1.6 Power Cable Replacement.

a. Connect the DC Power Cable with Power Adapter Cable to the TNB as instructed in paragraph. 2.3.3.2.

b. Route the cable to the FCU and attach it to the power connector.

c. Ensure the cable is installed out of the way, then secure it with fastener tape.

3.2.1.7 FCU/FU Interconnect Cable Removal.

a. Disconnect the Interconnect Cable from the FU and the FCU.

b. Undo all fastener tape retaining the cable and remove the cable.

c. Clean cable/connector(s) and prepare for turn in.

3.2.1.8 FCU/FU Interconnect Cable Replacement.

a. Connect the cable to the interconnect connector at the FCU.

b. Route the cable outside to the FU and connect it to the interconnect connector.

c. Ensure the cable is installed out of the way, then secure it with fastener tape.

3.2.1.9 Trigger Cable Removal.

a. Disconnect the KSI Trigger Cable from the FU, the KSI, and the System Cable or the DIFCUE KSI Trigger Cable.

b. Undo all fastener tape retaining the cable and remove the cable.

c. Clean cable/connector(s) and prepare for turn in.

3.2.1.10 Trigger Cable Replacement.

a. Connect the KSI Trigger Cable to the KSI Trigger Cable connector on the FU.

b. Route the other two segments of the cable to the KSI.

c. Attach the (P1) cable segment to the KSI, and attach the other segment to either the MILES 2000 System Cable or the DIFCUE cable as described in paragraph. 2.3.3.1.

d. Ensure the cable is installed out of the way, then secure it with fastener tape.

3.3 MGSS REMOVAL PROCEDURES.

Perform the following procedures to remove and store MGSS equipment. Always ensure that **ALL** power to the equipment is OFF before disassembly.

CAUTION

Once the equipment has been cleaned and inspected, if there is any damage to the equipment, report damage on the appropriate form (a separate form for each piece of equipment), and turn in with damaged equipment.

Place equipment and cable(s) in the transit case.

3.3.1 Firing Unit Disassembly.

a. Place the MGSS FCU SAFE/ARM toggle switch to the "SAFE" (down) position.

b. Approach the FU, staying out of the firing path.

c. Place the MGSS FU SAFE/ARM wheel to the "SAFE" position.

d. Disconnect the Interconnect and Trigger Cables from the FU connectors.

e. After lifting the handles on each side, open the cartridge carrier of the FU. Unload any remaining pyrotechnic cartridges. Ensure ALL pyrotechnic cartridges have been removed.

f. With cartridge carrier open, remove the retaining bolts securing the FU to the mounting adapter and remove the FU from the adapter.

g. Close the cartridge carrier of the FU and lock it with the handles on each side.

h. Remove the bolts securing the mounting adapter to the vehicle. Set the bolts aside.

i. Replace the smoke grenade storage box on the vehicle in place of the FU, and secure the box with the bolts removed from the FU mounting adapter. Also replace the 3/4-inch bolts at the top of turret.

j. Clean and inspect equipment. If there is any damage to the equipment, report damage on the appropriate form, and turn in with damaged equipment.

k. Place equipment in the transit case.

3.3.2 Fire Control Unit Removal.

a. Disconnect the DC Power Supply and FCU/FU Interconnect Cables from the Fire Control Unit connectors.

b. Remove the FCU from the fastener tape on the commander's station wall.

c. Clean and inspect equipment. If there is any damage to the equipment, report damage on the appropriate form, and turn in with damaged equipment.

d. Place equipment in the transit case.

3.3.3 Cable Removal.

a. Remove Power Adapter Cable from the Turret Network Box (TNB).

b. Disconnect the MGSS KSI Trigger Cable from the KSI, or from the MILES 2000 System Cable, or from the DIFCUE KSI Trigger Cable.

c. Detach cable fastener tape from fastener tape on vehicle to remove the Power Supply, KSI Trigger, and Interconnect cables.

d. Clean and inspect cables. If there is any damage to the equipment, report damage on the appropriate form, and turn in with damaged equipment.

e. Place cables in the transit case.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS **For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.**	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Exact wording of recommended change must be given)*

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

DA FORM 1 FEB 74 **2028**

REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED.

TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*	**DATE**

PART II- REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION/FORM NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	FEDERAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPROTED	RECOMMENDED ACTION

PART III - REMARKS ***(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)***

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

☆U.S. GOVERNMENT PRINTING OFFICE 1981 341-646/8606